Space Solar Power Concept Technology Maturation
Technical Interchange Meeting
Glenn Research Center, Cleveland OH
September 10-12, 2002

Output from Working Group Session: SIWG

SIWG Session Members

- Chair: Harvey Feingold
- Co-Chair: Jay Penn

- Monica Doyle
- David Elkin
- Paul Gill
- Joe Howell
- Glenn Law
- David Maynard
- Paul Schmitz

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- The past few years have seen technology development and new technologies emerge which could have an impact on reaching the goals of SSP.

- List the technologies which may have the possibility to achieve the goals of SSP. These technologies must have **revolutionary** potential and address one or more of the following characteristics:
    - Significant mass reduction
    - Dramatically improve efficiency
    - Considerable cost reduction
    - Reliability and longevity improvements
    - Ability to withstand operating environments

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Table 1

List of System Activities & Revolutionary Technologies:

1. Concepts that utilize solid state and solar pumped laser technologies
   - Laser systems should utilize ground receivers which collect both direct solar and laser beamed energy
   - Two types of solar pumped laser approaches: wide and narrow spectrum
   - Evaluate and model
2. Hot Dot Array Microwave Concept (final microwave concept, honest!)
3. Sandwich Concept - model if a feasible thermal control design can be derived
4. Advanced thermal control technologies (e.g. micro-channels) and system approaches that will enable concepts such as the Sandwich Concept
5. Potential future application: use lasers as direct heating and/or dissociation to generate fuels on the ground

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Table 2

Detailed description and assessment of technologies from Table 1. List the impact to the SSP goals and the other related technologies:

1. Potential for economically-viable SSP system
2. Potential for economically-viable SSP system
3. Potential for economically-viable SSP system
4. Work closely with micro-channel thermal control awardees to define system requirements, particularly for Sandwich Concept. Opportunity for broad range of space applications.
5. Provides energy source other than electricity for terrestrial use

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Table 3

Consensus on the future direction of research and development to solve the challenges of SSP:

Near Term:

- Develop models of concepts from Table 1 to support decision making for future technology investments and concept developments

- Flow-down requirements to technology experts

- Identify promising ground and flight demonstration systems

Far Term:

SIWG Issues

- Need experienced cost analysis team and industry-recognized cost models
  - Desire expertise in space systems and mass production
  - PRICE, SEER ?
- Future ISM spectrum availability for Microwave concepts
- Desperate need for Laser system information
  - Aerospace, Boeing, JPL, LaRC, UAH
- Question about Microwave concept from Professor Pavlidis from University of Michigan
  - Grating lobes are a concern for distributed transmitting devices

Laser Diode Concept Issues

- Electrical-to-optical conversion efficiency, lifetime, and operating temperature of laser diodes
- Coupling efficiency of diode energy into lasing fibers
- Fiber-to-bundle coupling efficiencies
- Bundle-to-telescope coupling efficiencies
- Integrated vs. separate solar array and laser diode heat rejection, including life effects
- Optimization of ground receiver for economics

Solar Pumped Laser Concept Issues

- What does a Solar Pumped Laser spacecraft look like?
    - Need spacecraft definition
- Conversion efficiency of white light into lasing frequencies and coupling efficiencies into laser fibers
- Ability to phase lock fibers with spectral frequency
- Optimization of ground receiver for economics
- LaRC has worked Solar Pumped Lasers in the past
- JPL Solar Pumped Laser contact:
    - Leo DeDominico

SIWG Action Items

- Status of Boeing Laser concept model
  - Paul Gill
- Get name of contact at LaRC for Solar Pumped Laser
  - David Elkin and/or Paul Gill
- Laser diode efficiency, temperature, lifetime discussion
  - Paul Schmitz, Monica Doyle, Aerospace, Boeing, UAH
- TITAN modeler's meeting to develop a common architecture for systems modeling
  - Harvey Feingold will set up